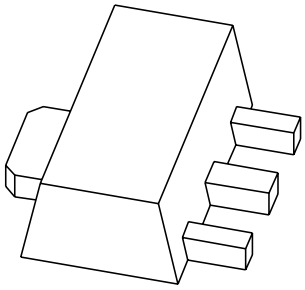
查询PBSS4320X供应商



# DATA SHEET



# PBSS4320X
## 20 V, 3 A
## NPN low $V_{CEsat}$ (BISS) transistor

Product specification
Supersedes data of 2003 Dec 15

2004 Nov 03

Philips
Semiconductors

PHILIPS

# 20 V, 3 A NPN low $V_{CEsat}$ (BISS) transistor

# PBSS4320X

## FEATURES

- SOT89 (SC-62) package
- Low collector-emitter saturation voltage $V_{CEsat}$
- High collector current capability: $I_C$ and $I_{CM}$
- Higher efficiency leading to less heat generation
- Reduced printed-circuit board requirements.

## APPLICATIONS

- Power management
  - DC/DC converters
  - Supply line switching
  - Battery charger
  - LCD backlighting.
- Peripheral drivers
  - Driver in low supply voltage applications (e.g. lamps and LEDs).
  - Inductive load driver (e.g. relays, buzzers and motors).

## DESCRIPTION

NPN low $V_{CEsat}$ transistor in a SOT89 plastic package.
PNP complement: PBSS5320X.

## MARKING

| TYPE NUMBER | MARKING CODE |
|---|---|
| PBSS4320X | S44 |

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | UNIT |
|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | 20 | V |
| $I_C$ | collector current (DC) | 3 | A |
| $I_{CM}$ | peak collector current | 5 | A |
| $R_{CEsat}$ | equivalent on-resistance | 105 | mΩ |

## PINNING

| PIN | DESCRIPTION |
|---|---|
| 1 | emitter |
| 2 | collector |
| 3 | base |

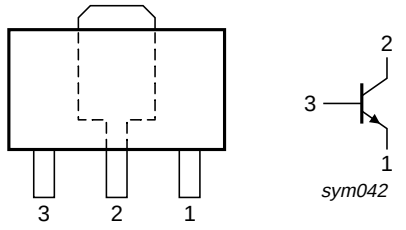



Fig.1 Simplified outline (SOT89) and symbol.

## ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|---|---|---|---|
| | NAME | DESCRIPTION | VERSION |
| PBSS4320X | SC-62 | plastic surface mounted package; collector pad for good heat transfer; 3 leads | SOT89 |

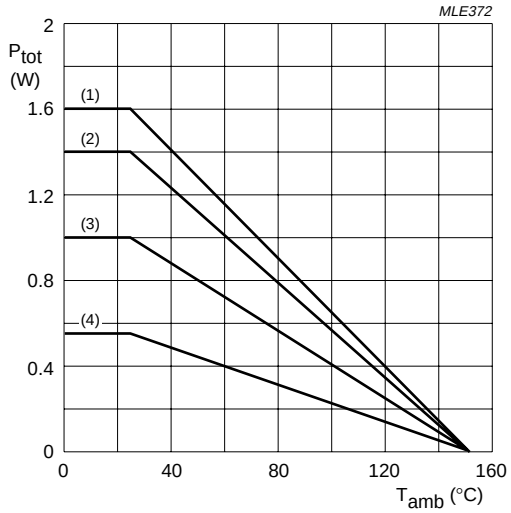
## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{CBO}$ | collector-base voltage | open emitter | – | 20 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | – | 20 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | – | 5 | V |
| $I_C$ | collector current (DC) | note 4 | – | 3 | A |
| $I_{CM}$ | peak collector current | limited by $T_{j(max)}$ | – | 5 | A |
| $I_B$ | base current (DC) | | – | 0.5 | A |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | | | |
| | | note 1 | – | 550 | mW |
| | | note 2 | – | 1 | W |
| | | note 3 | – | 1.4 | W |
| | | note 4 | – | 1.6 | W |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | junction temperature | | – | 150 | °C |
| $T_{amb}$ | ambient temperature | | –65 | +150 | °C |

**Notes**

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 $cm^2$.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 $cm^2$.
4. Device mounted on a ceramic printed-circuit board 7 $cm^2$, single-sided copper, tin-plated.




(1) Ceramic PCB; 7 $cm^2$ mounting pad for collector.
(2) FR4 PCB; 6 $cm^2$ copper mounting pad for collector.
(3) FR4 PCB; 1 $cm^2$ copper mounting pad for collector.
(4) Standard footprint.

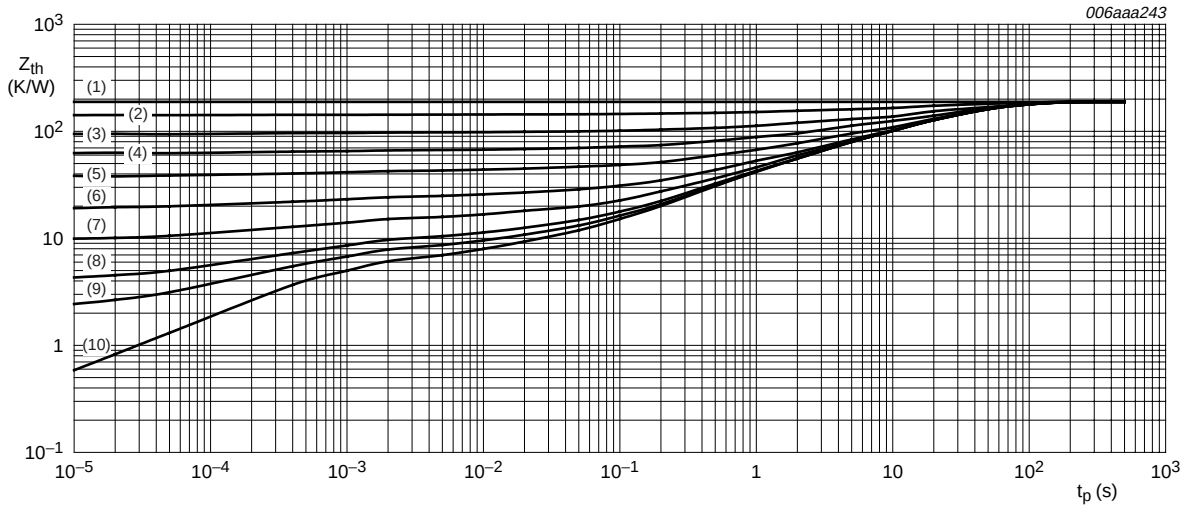
Fig.2 Power derating curves.

## THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | |
| | | note 1 | 225 | K/W |
| | | note 2 | 125 | K/W |
| | | note 3 | 90 | K/W |
| | | note 4 | 80 | K/W |
| $R_{th(j-s)}$ | thermal resistance from junction to soldering point | | 16 | K/W |

**Notes**

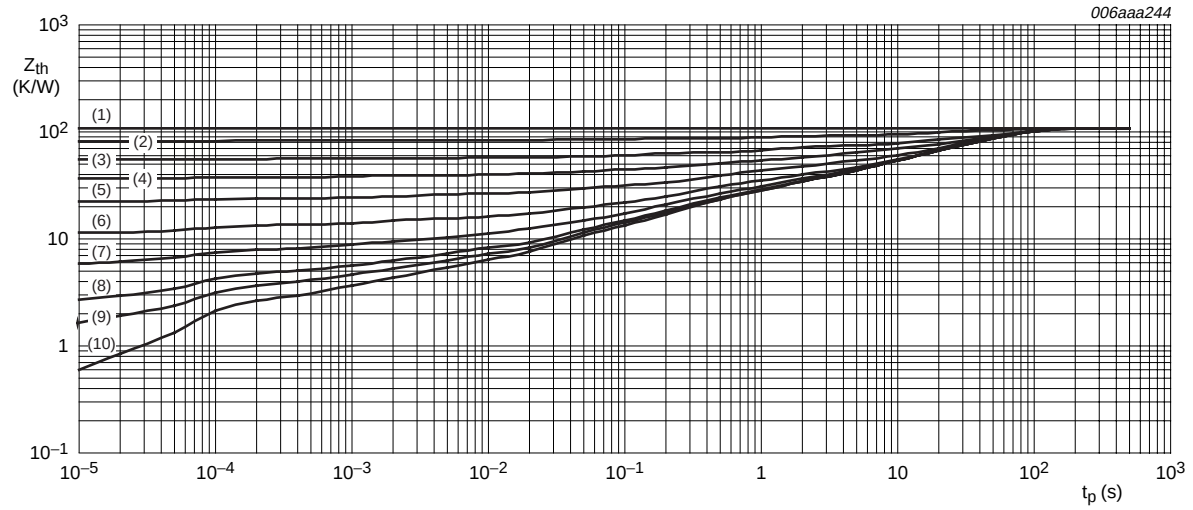
1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 $cm^2$.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 $cm^2$.
4. Device mounted on a ceramic printed-circuit board 7 $cm^2$, single-sided copper, tin-plated.




Mounted on FR4 printed-circuit board; standard footprint.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

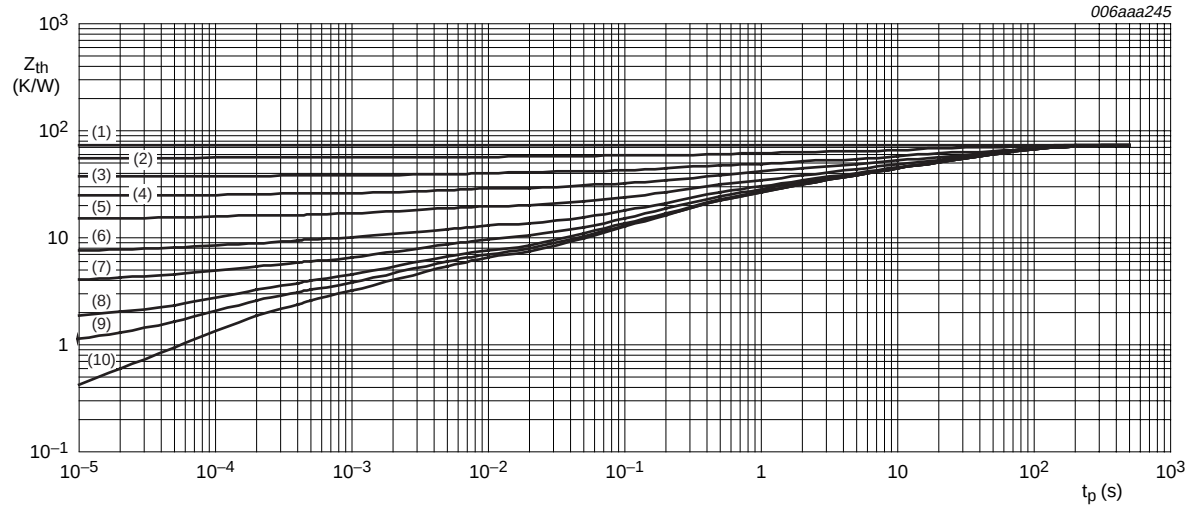
Fig.3 Transient thermal impedance as a function of pulse time; typical values.




Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm$^2$.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.4 Transient thermal impedance as a function of pulse time; typical values.




Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm$^2$.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

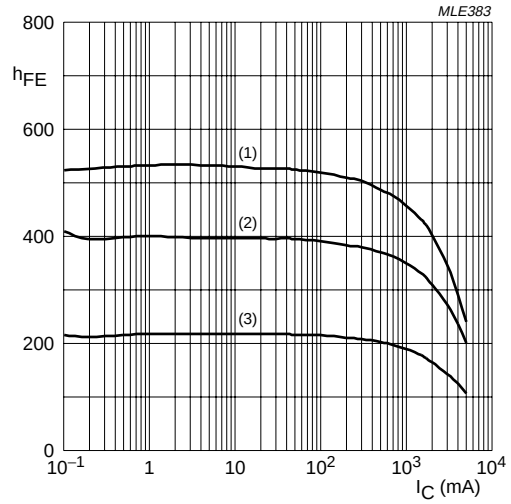
## CHARACTERISTICS

$T_{amb}$ = 25 °C unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 20 V; $I_E$ = 0 A | – | – | 100 | nA |
| | | $V_{CB}$ = 20 V; $I_E$ = 0 A; $T_j$ = 150 °C | – | – | 50 | µA |
| $I_{CES}$ | collector-emitter cut-off current | $V_{CE}$ = 20 V; $V_{BE}$ = 0 V | – | – | 100 | nA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 5 V; $I_C$ = 0 A | – | – | 100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 2 V | | | | |
| | | $I_C$ = 0.1 A | 220 | – | – | |
| | | $I_C$ = 0.5 A | 220 | – | – | |
| | | $I_C$ = 1 A; note 1 | 220 | – | – | |
| | | $I_C$ = 2 A; note 1 | 200 | – | – | |
| | | $I_C$ = 3 A; note 1 | 150 | – | – | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 0.5 A; $I_B$ = 50 mA | – | – | 70 | mV |
| | | $I_C$ = 1 A; $I_B$ = 50 mA | – | – | 120 | mV |
| | | $I_C$ = 2 A; $I_B$ = 100 mA | – | – | 240 | mV |
| | | $I_C$ = 3 A; $I_B$ = 300 mA; note 1 | – | – | 310 | mV |
| $R_{CEsat}$ | equivalent on-resistance | $I_C$ = 3 A; $I_B$ = 300 mA; note 1 | – | 85 | 105 | mΩ |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 2 A; $I_B$ = 100 mA | – | 1.1 | – | V |
| | | $I_C$ = 3 A; $I_B$ = 300 mA; note 1 | – | – | 1.2 | V |
| $V_{BEon}$ | base-emitter turn-on voltage | $V_{CE}$ = 2 V; $I_C$ = 1 A | 1.1 | – | – | V |
| $f_T$ | transition frequency | $I_C$ = 100 mA; $V_{CE}$ = 5 V; f = 100 MHz | 100 | – | – | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E$ = $i_e$ = 0 A; f = 1 MHz | – | – | 35 | pF |

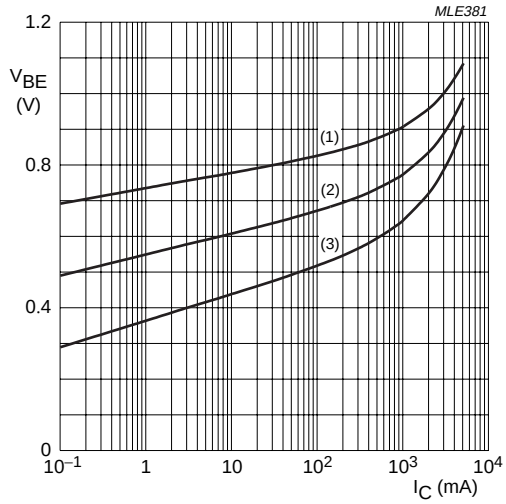
**Note**

1. Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



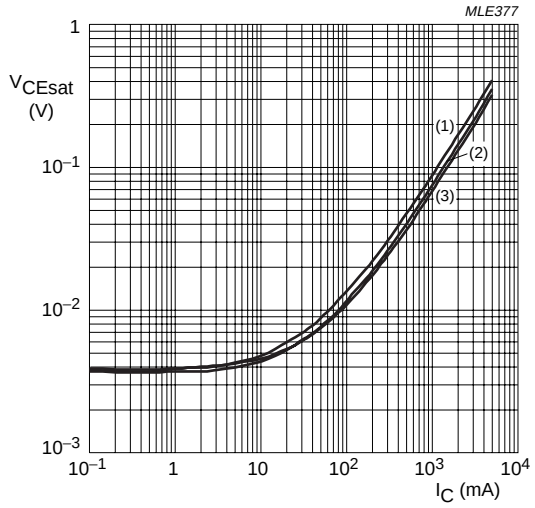

$V_{CE}$ = 2 V.
(1) $T_{amb}$ = 100 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = –55 °C.

Fig.6 DC current gain as a function of collector current; typical values.



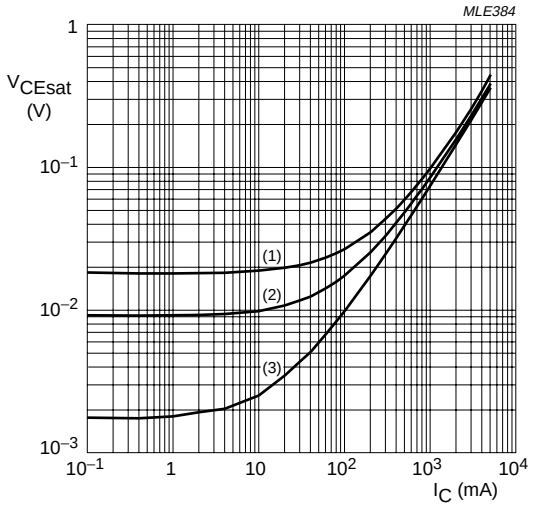

$V_{CE}$ = 2 V.
(1) $T_{amb}$ = –55 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = 100 °C.

Fig.7 Base-emitter voltage as a function of collector current; typical values.



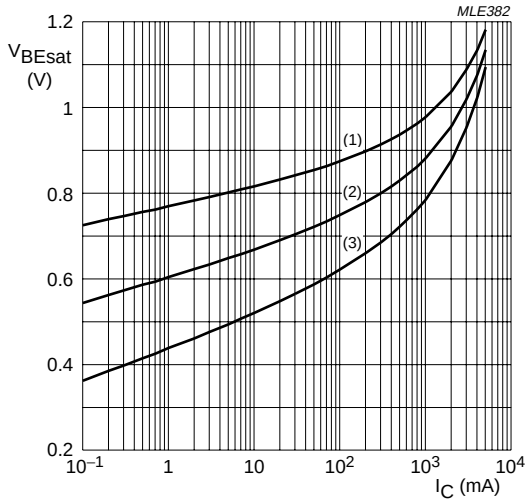

$I_C/I_B$ = 20.
(1) $T_{amb}$ = 100 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = –55 °C.

Fig.8 Collector-emitter saturation voltage as a function of collector current; typical values.



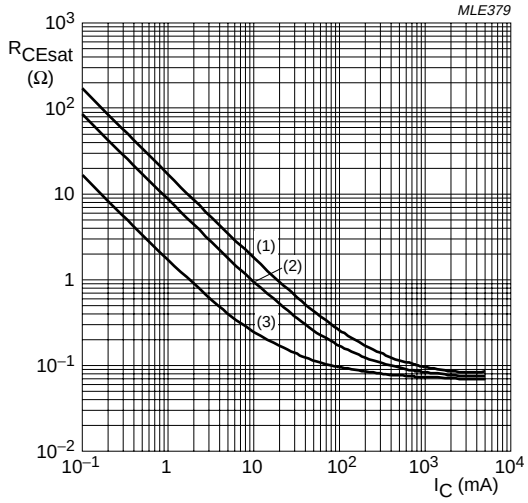

$T_{amb}$ = 25 °C.
(1) $I_C/I_B$ = 100.
(2) $I_C/I_B$ = 50.
(3) $I_C/I_B$ = 10.

Fig.9 Collector-emitter saturation voltage as a function of collector current; typical values.



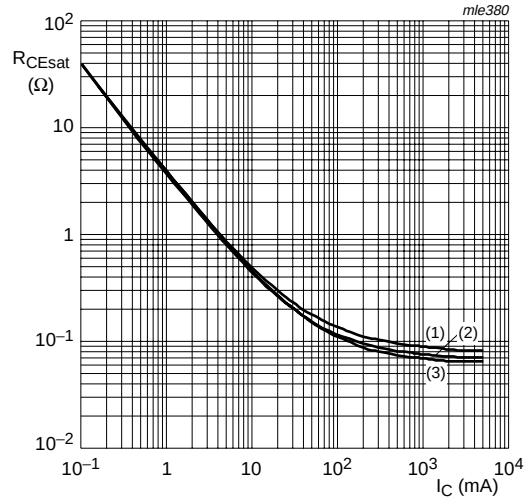

$I_C/I_B$ = 20.
(1) $T_{amb}$ = –55 °C.
(2) $T_{amb}$ = 25 °C.
(3) $T_{amb}$ = 100 °C.

Fig.10 Base-emitter saturation voltage as a function of collector current; typical values.



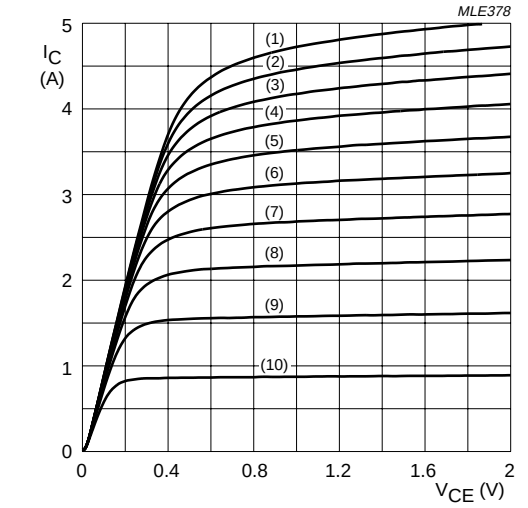

$T_{amb}$ = 25 °C.
(1) $I_C/I_B$ = 100. (2) $I_C/I_B$ = 50. (3) $I_C/I_B$ = 10.

Fig.11 Equivalent on-resistance as a function of collector current; typical values.




$I_C/I_B$ = 20.
(1) $T_{amb}$ = 100 °C. (2) $T_{amb}$ = 25 °C. (3) $T_{amb}$ = –55 °C.

Fig.12 Equivalent on-resistance as a function of collector current; typical values.

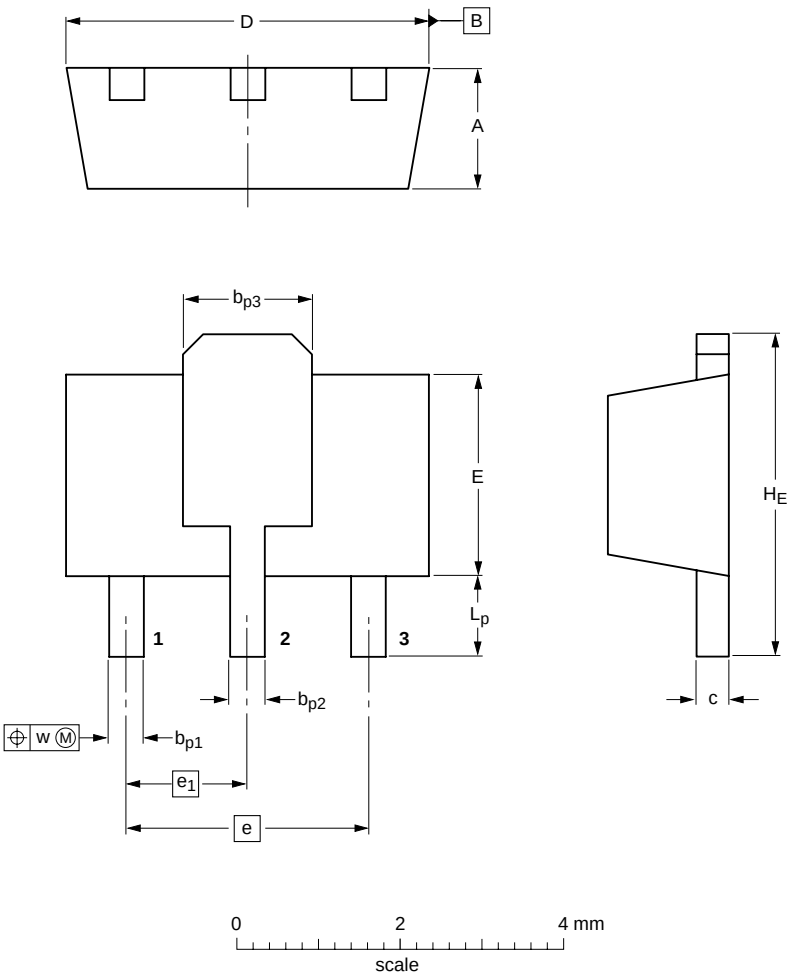



$T_{amb}$ = 25 °C.
(1) $I_B$ = 25 mA. (5) $I_B$ = 15 mA. (9) $I_B$ = 5 mA.
(2) $I_B$ = 22.5 mA. (6) $I_B$ = 12.5 mA. (10) $I_B$ = 2.5 mA.
(3) $I_B$ = 20 mA. (7) $I_B$ = 10 mA.
(4) $I_B$ = 17.5 mA. (8) $I_B$ = 7.5 mA.

Fig.13 Collector current as a function of collector-emitter voltage; typical values.

## PACKAGE OUTLINE

**Plastic surface mounted package; collector pad for good heat transfer; 3 leads** **SOT89**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $b_{p1}$ | $b_{p2}$ | $b_{p3}$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.6<br>1.4 | 0.48<br>0.35 | 0.53<br>0.40 | 1.8<br>1.4 | 0.44<br>0.23 | 4.6<br>4.4 | 2.6<br>2.4 | 3.0 | 1.5 | 4.25<br>3.75 | 1.2<br>0.8 | 0.13 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT89 | | TO-243 | SC-62 | | | ~~99-09-13~~<br>04-08-03 |

**DATA SHEET STATUS**

| LEVEL | DATA SHEET STATUS(1) | PRODUCT STATUS(2)(3) | DEFINITION |
|---|---|---|---|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
| II | Preliminary data | Qualification | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product. |
| III | Product data | Production | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

**Notes**

1. Please consult the most recently issued data sheet before initiating or completing a design.
2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

**DEFINITIONS**

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Application information** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

**DISCLAIMERS**

**Life support applications** — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status ‘Production’), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no licence or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

# *Philips Semiconductors – a worldwide company*

**Contact information**

For additional information please visit **http://www.semiconductors.philips.com**. Fax: **+31 40 27 24825**
For sales offices addresses send e-mail to: **sales.addresses@www.semiconductors.philips.com**.

© Koninklijke Philips Electronics N.V. 2004 SCA76

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands R75/03/pp12 Date of release: 2004 Nov 03 Document order number: 9397 750 13881

Let's make things better.

Philips
Semiconductors

PHILIPS